

NOTES FROM THE
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MATERIALS FOR A FLORA OF TURKEY: XVIII
LEGUMINOSAE: ASTRAGALUS

D. F. CHAMBERLAIN & V. A. MATTHEWS
(University of Edinburgh)

Astragalus is the largest genus in Turkey—we have recognised over 370 species for the Flora account of which 26 are here described as new. The taxonomic treatment of this genus has undoubtedly suffered from a narrow species concept originating from Bunge's monograph on the *Astragalus* species of the Old World (*Generis Astragali species Gerontogaeae*, 1868–69). Boissier's account in the *Flora Orientalis* (1872) was a considerable improvement and considering the material available to him Boissier has provided a surprisingly sound basis for further work on the genus. Nevertheless this narrow species concept has to some extent become a self-perpetuating process resulting in the publication of many unnecessary names for minor variants that would not fit into the existing species descriptions. The number of species names now published makes a comprehensive revision an immense undertaking, even for SW Asia. This is to some extent reflected in the recent revisions of individual sections produced by Rechinger *et al.** These provide a guide to species names and a key (with descriptions incorporated), but do not go very far towards rectifying the confusion or making the taxa easier to identify. Širjaev's own contributions† are perhaps more searching, but the creation of many new infraspecific taxa where the variation patterns were little understood has not helped the situation. Eig (*Systematic Studies on Astragali of the Near East*, 1955) has published several new names for Turkish Astragali, mainly from the Amanus, but these again mostly appear to be unnecessary minor splits, in some cases based on totally inadequate type specimens.

* Širjaevii Fragmenta Astragalologia. *Sitzb. Acad. Wien* 167: 51–93, 321–361 (1958); 168: 95–182, 693–718, 719–767 (1958); 170: 9–68 (1961).

† Conspectus Tragacantharum (*Astragalus* L. subgenus *Tragacantha* Bunge). *Feddes Rep.* 47: 194–208, 225–261 (1939). Conspectus Praecursions Speciarum subg. *Trimenaeus* Bunge, generis *Astragali* L. *Feddes Rep.* 53: 220–253 (1944).

The difficulty of effectively subdividing the genus certainly does nothing to ease the problems of providing an adequate taxonomic treatment of *Astragalus*. Since many of the sections and even some of the subgenera are delimited on the basis of minor characters, it is easy to misplace a species or to describe a species as new when it is synonymous with a taxon in some other section. With the number of species involved it is almost impossible to check every published name in *Astragalus* to be sure of avoiding unnecessary duplication through possible misplacement.

Our policy in preparing the *Astragalus* account for the *Flora of Turkey* has been to maintain taxa where there remains some doubt as to their distinctness. In particular this applies to several critical species complexes, even though we expect that detailed study, especially at the level of the population, will result in reduction to synonymy. The new taxa described below have been compared with named material from surrounding countries as represented in the Herbaria at the British Museum (London), at Edinburgh and at Kew. V. A. Matthews has visited the herbaria in Vienna and in Leningrad, and type material has been borrowed from various other herbaria (B, BRA, G, HUJ, JE, LD, P, TBI, UPS). As far as can be reasonably ascertained, the new taxa have not been previously described.

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NOTES ON THE SECTIONS

For the *Flora of Turkey* account we have followed in broad outline the infrageneric treatment of Boissier's *Flora Orientalis*. We do not, however, wish to imply that it is a natural one, but rather that it is on the whole convenient to use. Such changes that we have made to this treatment only apply to sections well represented in Turkey. Where a section largely occurs outside Turkey (and we have studied only a small proportion of the species), we have tended to accept Boissier's classification, even where there is some doubt as to the distinctness of individual sections involved.

The importance of leaflet indumentum, a key character in Boissier's classification, illustrates the problems involved. *Astragalus* may be conveniently split on the basis of simple (\pm basifixed) versus bifurcate (\pm medifixed) leaflet hairs. The sections with Turkish representatives fall, with one exception, into one category or another. There is apparently little parallelism between these groups, though when it does occur it is very striking. *A. sachenewii* Širj. in Sect. *Hypoglottis* (a species with simple-hairy leaflets) and *A. xerophilus* Ledeb. in Sect. *Onobrychium* (with bifurcate-hairy leaflets) are practically identical apart from this one character. It is tempting to consider that these two species (and by implication the two sections to which they belong) have had a common origin. Yet in Boissier's classification they are not treated as being at all related.

The inflated versus non-inflated calyx is generally also considered to be a key character, though here again the classification that it produces may be unnatural. The differences between, for instance, *A. canescens* DC. (Sect. *Onobrychium*), with a \pm non-inflated calyx, and *A. asciocalyx* (Sect.

Asciocalyx), with an inflated calyx, are relatively small. Because of this we have included Sect. *Asciocalyx* in Sect. *Onobrychium*. There is perhaps also a case for including Sect. *Cystodes* (with an inflated calyx) in Sect. *Xiphidium* (without an inflated calyx), but we hesitate to do so without more detailed study of a wider range of species.

The greatest problems at the sectional level arise in Subgenus *Tragacantha*. Indeed even the distinctions between it and Subgenus *Phaca* seem to be relatively weak. Sect. *Acanthophace* in Subgenus *Phaca* closely resembles in facies the 'Tragacanth' sections, in particular Sect. *Platonychium*, and several species can only be reliably placed in one or other of the subgenera on the basis of several-seeded legumes (Subgenus *Phaca*—Sect. *Acanthophace*) as opposed to 1(-2)-seeded legumes (Subgenus *Tragacantha*). Furthermore the 1(-2)-seeded state appears to have arisen by abortion of most of the ovules, as the ovary of some 'Tragacanth' species—contrary to Boissier's accounts—can have several ovules, sometimes up to 13 per ovary. In every case however, the legumes of Subgenus *Tragacantha* have no more than two seeds. To what extent it is reasonable to separate Sect. *Acanthophace* from the 'Tragacanth' sections, in particular Sect. *Platonychium*, on the basis of this one character remains open to some doubt. Because of the difficulties that arise in separating the subgenera, we have not used them in the Flora account and have restricted our infra-generic classification just to the sections.

Although both Širjaev and Borissova (Fl. URSS 12, 1946), have provided alternative sectional treatments for Subgenus *Tragacantha*, neither can be considered to be any improvement on Boissier's classification, at least as far as Turkish species are concerned. We have therefore followed Boissier's treatment more closely than the others but we have made several significant changes in the sectional position of certain species. We have for instance diverged from Boissier in considering the degree to which the petals are adnate to the staminal tube to be relatively unimportant. As a result we have transferred *A. caspius* Bieb., traditionally placed in Sect. *Stenonychium* to Sect. *Adiaspastus* and the remaining Turkish members of Sect. *Stenonychium* to Sect. *Rhacophorus*.

Boissier included in Sect. *Rhacophorus* those species lacking bracteoles with stenonychioid standards, whereas he included the bracteolate species in Sect. *Pterophorus*. We have diverged from this treatment in restricting Sect. *Pterophorus* to species with bracteoles resembling the calyx lobes (both densely hairy to the base). We have therefore transferred several taxa with bracteoles not resembling the calyx lobes (usually glabrous for at least half their length) from Sect. *Pterophorus* sensu Boiss. to Sect. *Rhacophorus*. Consequently we treat several species in Sect. *Rhacophorus* as including variants differing in the presence or absence of such bracteoles where this is either the only difference or the major difference. *A. seytunensis* Bunge (Sect. *Pterophorus* sensu Boiss.), for instance, becomes a variety of *A. pycnocephalus* Fisch. in Sect. *Rhacophorus*.

Because of the complexity of the genus, the construction of a key has proved a difficult task. We have relied heavily on measurements to avoid cumbersome dichotomies, realising that this may well produce a less robust key if additional material extends the measurement range. For this reason we strongly recommend that, wherever possible, reference should be made

to properly named herbarium material before confirming the identity of new specimens. The need for adequate material cannot be over-emphasised. In particular this applies to all the annual sections and to Sections *Christiana*, *Ornithopodium*, *Onobrychium* and *Proselius* where material both in flower and in fruit will greatly facilitate identification. With a few exceptions it is unwise even to attempt to identify sterile material.

Our Flora account is inevitably to some extent provisional, either because we have not seen adequate material or because time was not available to study the difficult species problems in sufficient depth. This means that there remain some key characters whose relative importance requires more careful assessment, and several species complexes where further research is indicated.

The problems created by the division between simple and bifurcate hairy leaflets, between several- and 1-seeded legumes, and between inflated and non-inflated calyces have already been discussed. This list should be extended to include caulescent versus acaulous plants, whether the stipules are adnate to the petioles or not, and bracteolate versus ebracteolate flowers.

Undoubtedly the most intractable species problems are to be found in Sections *Rhacophorus* and *Pterophorus*, and to a lesser extent also in Sections *Dasyphyllum*, *Onobrychium* and *Hololeuce*. These are discussed in the notes accompanying the species accounts in the *Flora of Turkey*. In these instances proper population analysis might provide some of the required answers and would probably well repay the sometimes thorny problems posed in collecting adequate material.

Sect. DASYPHYLLIUM Bunge

A. coadunatus Huber-Morath & Chamberlain, sp. nov. Fig. 1, a.

Affinis *A. amasiensi* (Freyn) Bornm. et *A. densifolio* Lam. sed differt a priore foliolis minoribus, a posteriore bracteis inferioribus connatis.

Herba perennis scaposa, basi lignescens. *Folia* imparipinnata, 7–10 cm longa; stipulae late ovatae, nec acuminate, 12–15 mm longae, scariorae, breviter et parce albo-pilosae, inter se connatae, a petiolo liberae; foliola conferta, 20–35-juga, orbiculata, 2–4 mm lata, pilis simplicibus breviter lanata. *Pedunculi* 8–12(–28) cm longi, dense villosi. *Spica* densa, globosa vel breviter ovata, 20–35-flora. *Bracteae* late ovatae, inferiores saepe connatae, calyces aquantes, pilosae. *Bracteolae* nullae. *Calyx* tubulosus, c. 8 mm longus, pilis albis simplicibus lanatus; dentes subulati, c. 2 mm longi. *Corolla* in sicco purpurascens; vexillum lingulatum, 14–17 × c. 6 mm, lamina unguem aequante; alae c. 12 mm longae; carina c. 10 mm longa. *Legumen* immaturum dense pilosum, biloculatum, plurispernum.

TURKEY. A8 Erzurum: distr. Ispir, Erzurum-Ispir, Passhöhe 41 km südlich Ispir, Alpweide auf Kalk, 2200–2250 m, 8 vii 1959, Huber-Morath 16145 (holo. Hb. Hub.-Mor.); Ispir, 2200 m, 8 vii 1959, Alpay & Bozakman (ANKO 2526). A8 Gümüşane: Baiburt, Kop Da., 2300 m, limestone scree, flowers red-purple, Balls 1785; N side of Kop Da., 2000 m, 15 vii 1958, Markgraf 10980.

Sect. HYPOGLOTTIS Bunge

A. latistipulatus Chamberlain & Matthews, sp. nov. Fig. 1, b.

Herba perennis, erecta, caulescens, 20–40 cm alta. *Folia* imparipinnata, 6–15 cm longa; stipulae late ovatae, c. 15 mm longae, herbacei, glabrae,

per tribus quartis connatae, a petiolo liberae; foliola late elliptica vel ovato-lanceolata, 12–23 × 10–15 mm, glabra vel paucis pilis simplicibus provisa. *Pedunculi* 5–10 cm longi, glabri. *Spica* densa, c. 3 cm longa, 1·5–2 cm diametro, 30–40-flora. *Bracteae* linear-lanceolatae, c. 6 mm longae. *Bracteolae* nullae. *Calyx* 7–9 mm, tubulato-campanulatus, pilis nigris subpatentibus parce hirsutus; dentes lineares, c. 2 mm longi. *Corolla* violacea; vexillum c. 14 × 7 mm, lingulatum, emarginatum, lamina unguem aequante; alae c. 12 mm longae; carina c. 11 mm longa. *Ovarium* breviter stipitatum, parce pilosum. *Legumen* ignotum.

TURKEY. CIO Hakkari: Sat Dağ, NW of Sat Gölü, 1850 m, pastures at yayla, Davis 45503 (holo. E, iso. K).

Only known from the type gathering. Although at present known only from Turkey, it may also occur in N Iraq or NW Iran. In the absence of legumes, the affinities of this species remain uncertain. It does, however, superficially resemble *A. freynii* Alb., a Caucasian species, but the latter may be distinguished in the flowering state by its whitish flowers and smaller stipules.

A. dasycarpus Chamberlain, sp. nov. Fig. 1, c.

Herba perennis, subcaulescens, sericea, caudice indurato ramosissimo, procumbens. *Folia* imparipinnata, 1–2 cm longa; stipulae triangulare-lanceolatae, c. 2 mm longae, sericeae, breviter connatae, a petiolo liberae; foliola 6–10-juga, obovata, 2–4 × 1–2 mm, pilis simplicibus sericea. *Pedunculi* 2–3 cm longi, sericei. *Spica* densa, globosa, c. 2 cm diametro, 4–8-flora. *Bracteae* lanceolatae, c. 4 mm longae. *Bracteolae* nullae. *Calyx* tubulosus, 8–10 mm longus, pilis nigris paucis albisque dense pilosus, dentes lineares, c. 2 mm longi. *Corolla* lilacina; vexillum lingulatum, 18–22 × c. 6 mm, emarginatum, lamina ungue longiore; alae c. 13 mm longae; carina c. 11 mm longa. *Legumen* ovoidum, lateraleriter compressum, c. 10 × 4 mm, pilis longis albis dense pilosum; rostrum c. 2 mm longum.

TURKEY. B9 Van: d. Başkale, Ispiriz Da., 3400–3500 m, Davis 23710 (holo. E); d. Gevaş, Artos Da., 3650 m, scree, Davis 22880; d. Çatak, Kavuşşahap Da., 3400 m, scree, Davis 23110.

This species has no close relatives in Turkey, though perhaps most closely allied to *A. viciifolius* DC., a Caucasian and E Anatolian species, and to *A. sachenewii* Širj., endemic to E Anatolia. From both it may be distinguished by its densely long white-hairy legumes; from the former also by its sericeous leaflets and from the latter by its larger flowers.

Sect. STEREOTHRIX Bunge

A. sorgerae Huber-Morath & Chamberlain, sp. nov. Fig. 1, d.

Affinis *A. nano* DC. sed calycibus parce pilosis (non setulosis), et dentibus brevioribus c. 3 mm longis differt.

Herba perennis, caulescens, e caudice indurato procumbens, 15–20 cm alta. *Folia* imparipinnata, 3–5 cm longa; stipulae ovato-lanceolatae vel lanceolatae, 6–14 mm longae, herbaceae, parce pilosae, inter se connatae, a petiolo liberae; foliola 8–12-juga, elliptica vel oblonga, 5–9 × 3–5 mm, pilis simplicibus canescens. *Pedunculi* 1·5–5 cm longi, villosi. *Bracteae*

lanceolatae, 6–9 mm longae, *Bracteolae nullae*. *Calyx* tubulosus, 8–10 mm longus, pilis albis nigrisque simplicibus parce pilosus; dentes lineares, c. 3 mm longi. *Corolla* lutea; vexillum lingulatum, 16–18 × 6 mm, lamina unguem aequante; alae c. 13 mm longae; carina c. 12 mm longa. *Legumen* valde immaturum oblongum, hirsutum, bilobatum, plurispernum.

TURKEY C₃ Isparta: Dedegöldağ, c. 1600 m, 3 vii 1965, Sorger 65–43–129 (holo. Hb. Sorger, iso. Hb. Hub.-Mor.). C₂/3 Antalya: 24 km from Elmali to Korkuteli, c. 1150 m, steppe, Ehrendorfer 62–1/50–135.

A. sorgerae is allied to the S Anatolian *A. nanus* DC. and more distantly so to the E Anatolian *A. barbatus* Lam. Both these species differ in having setulose calyces with longer teeth (8–15 mm long). *A. barbatus* also differs in having longer bracts (12–15 mm long).

***A. sparsipilis* Huber-Morath & Chamberlain, sp. nov. Fig. 2, a.**

Herba perennis, caulescens, e caudice indurato procumbens; caulis 5–10 cm longis. *Folia* imparipinnata, 3–4 cm longa; stipulae lanceolatae, 6–8 mm longae, scariosae, setulosae, breviter connatae, ad petiolum adnatae; foliola 10–13-juga, elliptica, 4–6 × c. 3 mm, pilis simplicibus adpresso pilosa. *Pedunculi* c. 4 cm longi, pilosi. *Spica* globosa vel ovoidea, 1·5–2 cm longa, c. 1·5 cm diametro, 10–15-flora. *Bracteae* lineari-lanceolatae, 5–6 mm longae. *Bracteolae* nullae. *Calyx* tubulosus, 8–10 mm longus, pilis albis simplicibus parce setulosus, dentes lineares, 4–6 mm longi. *Corolla* lilacina; vexillum ligulatum, c. 19 × 3 mm, emarginatum, lamina ungue longiore; alae c. 13 mm longae; carina c. 11 mm longa. *Ovarium* glabrescens. *Legumen* ignotum.

TURKEY. B₆ Malatya/Kayseri: pass between Pinarbaşı and Gürün, Davis 21973. C₄ Konya: Alpweiden ob dem Wald von Gevne bei Hadim, 1800 m, 18 vi 1948, J. Renz, A. Huber-Morath 9473 (holo. Hb. Hub.-Mor.).

Closely allied to *A. coodei* Chamberlain & Matthews (q.v.) but distinguished by its shorter stems and peduncles.

***A. coodei* Chamberlain & Matthews, sp. nov. Fig. 2, b.**

Herba perennis, caulescens, e caudice ramoso, adscendens vel erecta; caules 20–35 cm longi. *Folia* imparipinnata, 5–9 cm longa; stipulae anguste ovato-lanceolatae, c. 6 mm longae, tuberculato-strigillose, inter se liberae, ad petiolam breviter connatae; foliola 10–13-juga, elliptica, 5–10 × c. 3 mm, pilis simplicibus adpresso-strigilosa. *Spica* dense globosa vel ovoidea, 1·5–2 cm longa, 1·3–1·5 cm diametro, 20–50-flora. *Bracteae* lineares, c. 6 mm longae. *Bracteolae* nullae. *Calyx* tubulosus, 9–10 mm longus, pilis simplicibus albis nigrisque parce setosus; dentes setacei, c. 4 mm longi. *Corolla* atropurpurea; vexillum ligulatum, 17–18 × c. 3·5 mm, lamina ungue duplo longiore; alae c. 12 mm longae; carina c. 8 mm longa. *Ovarium* parce pilosum. *Legumen* ignotum.

TURKEY. A₄ Ankara: Karagöl, 40 miles N of Ankara, 1100 m, open rocky slopes with *Pinus nigra*, Coode & Jones 2184 (holo. E). A₄ Bolu: 34 km SE of Gerede, 1600 m, open *Pinus pallasiana* woodland, Sorger 62–93–3; Ehrendorfer 62–1/82–7. B₄ Ankara: Çamlıdere, 1300 m, Alpay 304.

This species is closely related to the N Anatolian *A. leucothrix* Freyn & Bornm. and the C & S Anatolian *A. sparsipilis* Hub.-Mor. & Chamb., but may be distinguished from both species by its longer stems and peduncles. Further material may show that *A. coodei* is only a large form of *A. sparsipilis*, though, on the basis of the material seen, these two taxa have been maintained as separate species.

Sect. MALACOTHRIX Bunge

A. bashkalensis Chamberlain, sp. nov. Fig. 2, c.

Herba perennis e caudice lignoso scaposa. *Folia* imparipinnata, 6–7 cm longa; stipulae linear-lanceolatae, c. 8 mm longae, scariosae, dense pilosae, connatae et petiolo adnatae; foliola 8–16-juga, 5–7 × 3·5 mm, late elliptica, obtusa, pilis simplicibus dense et subadpresso canescens. *Pedunculi* 8–11 cm longi, pilis albis nigrisque patenter et breviter hirsuti. *Spica* c. 4 cm longa, c. 1·8 cm lata, breviter cylindrica, c. 30-flora. *Bracteae* lanceolatae, c. 5 mm longae. *Calyx* tubulosus basi gibbosus, c. 10 mm longus, pilis albis nigrisque villosum; dentes lineares 1–2 mm longi. *Corolla* malvina; vexillum c. 18 × 9 mm, emarginatum, lamina a basi lata rhombica attenuata; alae c. 17 mm longae; carina c. 16 mm longa. *Ovarium* pilosum, sessile. *Legumen* ignotum.

TURKEY B9 Van: Ispiriz Da., Güzeldere Tepe, 20 km NNW of Başkale, 2800 m, N to NE hillsides, grassy steppe, flowers pinkish-mauve, *Cheese & Watson* 1446 (holo. K).

This species which is only known from the type is probably rather distantly related to *A. tauriculus* Boiss. from S & E Anatolia, but without fruits its affinities remain uncertain.

A. comosoides Chamberlain & Matthews, sp. nov. Fig. 2, d.

Affinis *A. comosum* Bunge sed foliolis latioribus et pilis calycis pro parte maxima nigris recedit.

Herba perennis, e caudice indurato, scaposa vel breviter caulescens. *Folia* imparipinnata, 6–10 cm longa; stipulae lanceolatae, 4–6 mm longae, scariosae, parce pilosae, inter se liberae sed ad petiolem breviter adnatae; foliola 8–14-juga, elliptica vel oblonga, 6–8 × 3 mm, parce pilosa, pilis interdum ad costam restrictis. *Pedunculi* 10–16 cm longi, adpresso hirsuti. *Spica* laxa, cylindrica, 4–8 cm longa, c. 2 cm diametro, 20–60-flora. *Bracteae* linear-lanceolatae, c. 6 mm longae. *Bracteolae* nullae. *Calyx* tubulosus, 10–12 mm longus, pilis simplicibus nigris et albis paucis parce villosum; dentes setacei, c. 3 mm longi. *Corolla* violacea vel albescens; vexillum lingulato-deltoidem, 16–22 mm longum, lamina unguem aequante; alae c. 17 mm longae; carina c. 14 mm longa. *Legumen* ovoideum, c. 10 × 3 mm, sessile, pilis longis albis simplicibus pilosum, biloculatum, loculis 4–5-spermis.

TURKEY. B9 Van: east side of pass between Hoşap and Başkale, 2380 m, in calcareous gorge, flowers whitish, 9 vi 1966, *Davis* 44740 (holo. E, iso. K); Kurubaş, 9 km SE of Van, 1850 m, cultivated ground in irrigated steppe, *Davis* 44616. B10 Van: 3–4 km NE of Başkale, 2300 m, *Davis* 44522. C10 Hakkari: 21 km from Bacırge to Yüksekova, 2230 m, meadows on shaly

soil, flowers violet, *Davis* 45244; Bacirge, 1700–1800 m, dry stony slopes, *Davis* 45282.

Closely allied to *A. comosus* Bunge. The latter may be distinguished by its narrowly oblong leaflets and predominantly white-hairy calyces.

Sect. MYOBROMA Bunge

A. ramicaudex Chamberlain, sp. nov. Fig. 1, e.

Herba perennis acaulis, e caudice ramosissimo indurato, prostrata. *Folia* imparipinnata, 4–8 cm longa; stipulae lanceolatae, c. 5 mm longae, scariosae, ciliatae, a petiolo et inter se liberae; foliola 12–16-juga, late ovata vel orbicularia, obtusa vel emarginata, pilis simplicibus dense villosa. *Racemi* sessiles, e floribus 4–6 pedicellatis compositi. *Bracteae* ellipticae, c. 4 mm longae. *Bracteolae* nullae. *Calyx* tubulari-campanulatus, pilis albis simplicibus parce pilosus; dentes superiores lineares c. 4 mm longi, inferiores triangulares c. 2 mm longi. *Corolla* lutea; vexillum late lingulatum vel obovatum, emarginatum, 12–16 mm longum; alae 11–13 mm longae; carina 9–11 mm longa. *Ovarium* parce pilosum; stylus infra stigmate caespite pilosus. *Legumen* ignotum.

TURKEY. B6 Maraş: Berit Dağ to Elbistan, 1600 m, on very steep stony soil, 16 vi 1960, *Stainton & Henderson* 5614 (holo. E).

Only known from the type specimen. Closely allied to *A. pinetorum* Boiss., another Turkish endemic, with which it has in common a tuft of hairs on the style below the stigma. *A. pinetorum* differs, however, in its longer standard (16–20 mm long) and sparsely hairy leaflets.

Sect. ACANTHOPHACE Bunge

A. baytopianus Chamberlain & Matthews, sp. nov. Fig. 2, e.

A. delanensem Širj. & Rech. f. proxima, sed foliolis longioribus, bracteis pilis nigris albisque obsitis, legumine albo-piloso diversa.

Fruticulus. *Folia* paripinnata 4–6 cm longa, rhachide spinosa; stipulae 9–12 mm longae, triangulari-lanceolatae albo-pubescentes calvescentes ad dimidium connatae; foliola 4–5-juga, 10–16 mm longa, lineari-elliptica ad apicem spinosa, supra glabra, subtus parcissime adpressim simpliciter pilosa. *Inflorescentiae* 3–4-florae, axillares, congestae, capitulum densum 1.5–2 cm diametro 15–20-florum formantes. *Bracteae* c. 8 mm longae, ovato-lanceolatae navicularae, pilis nigris albisque parce pilosae. *Bracteolae* nullae. *Calyx* 13–15 mm longus, tubulosus, pilis albis nigrisque simpliciter pilosus; dentes c. 7 mm longi, setacei. *Corolla* colore ignota; vexillum 15–18 mm longum, glabrum, lamina obovata basi auriculata; alae 12–15 mm longae; carina 11–13 mm longa. *Legumen* 6–8 mm longum, 2 mm latum, anguste ovoideum, pilis patentibus albis vestitum.

TURKEY. B9 Van: Van-Çatak, c. 2000 m, 9 viii 1956, *T. Baytop* 4897 (holo. E, iso. ISTF).

A. baytopianus is most closely related to the rare *A. delanensis* Širj. & Rech. f.

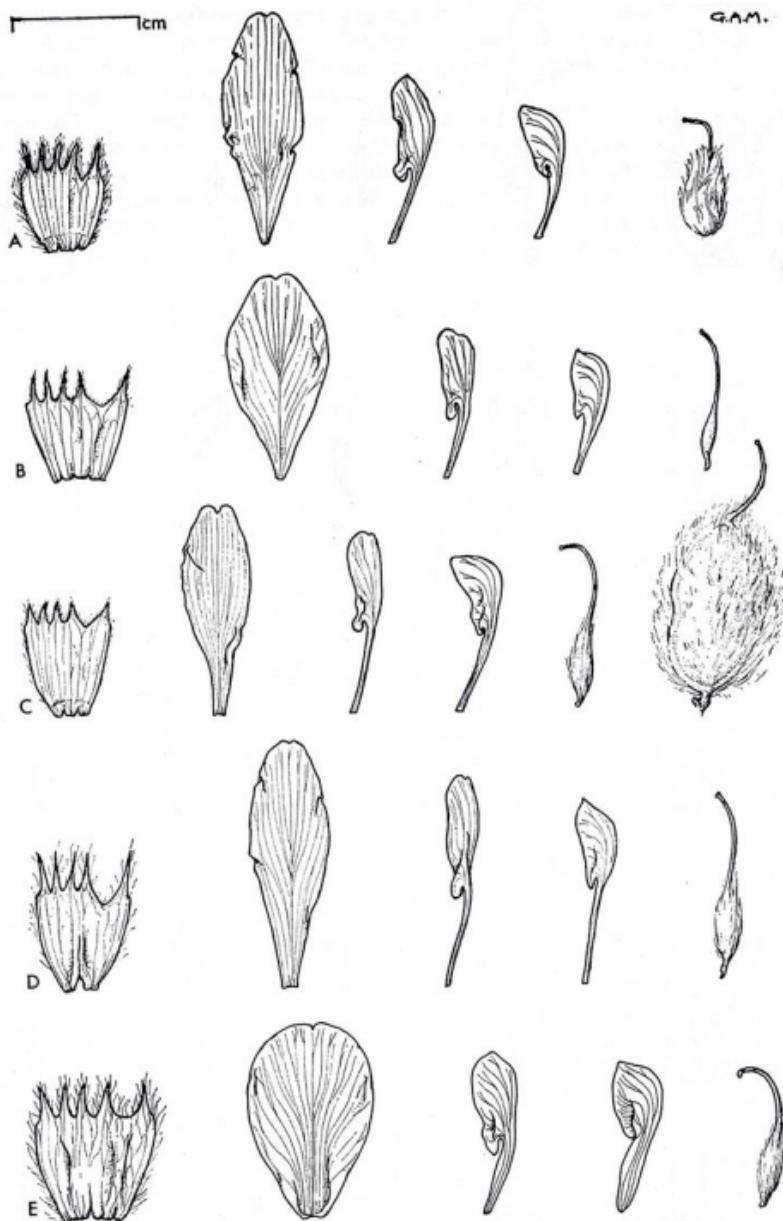


FIG. 1. A. *Astragalus coadunatus*. B. *A. latistipulatis*. C. *A. dasycarpus*. D. *A. sorgerae*. E. *A. ramicaudex*. Left to right—calyx, standard, wing, keel, or young legume, legume where present, throughout figs. 1–6.

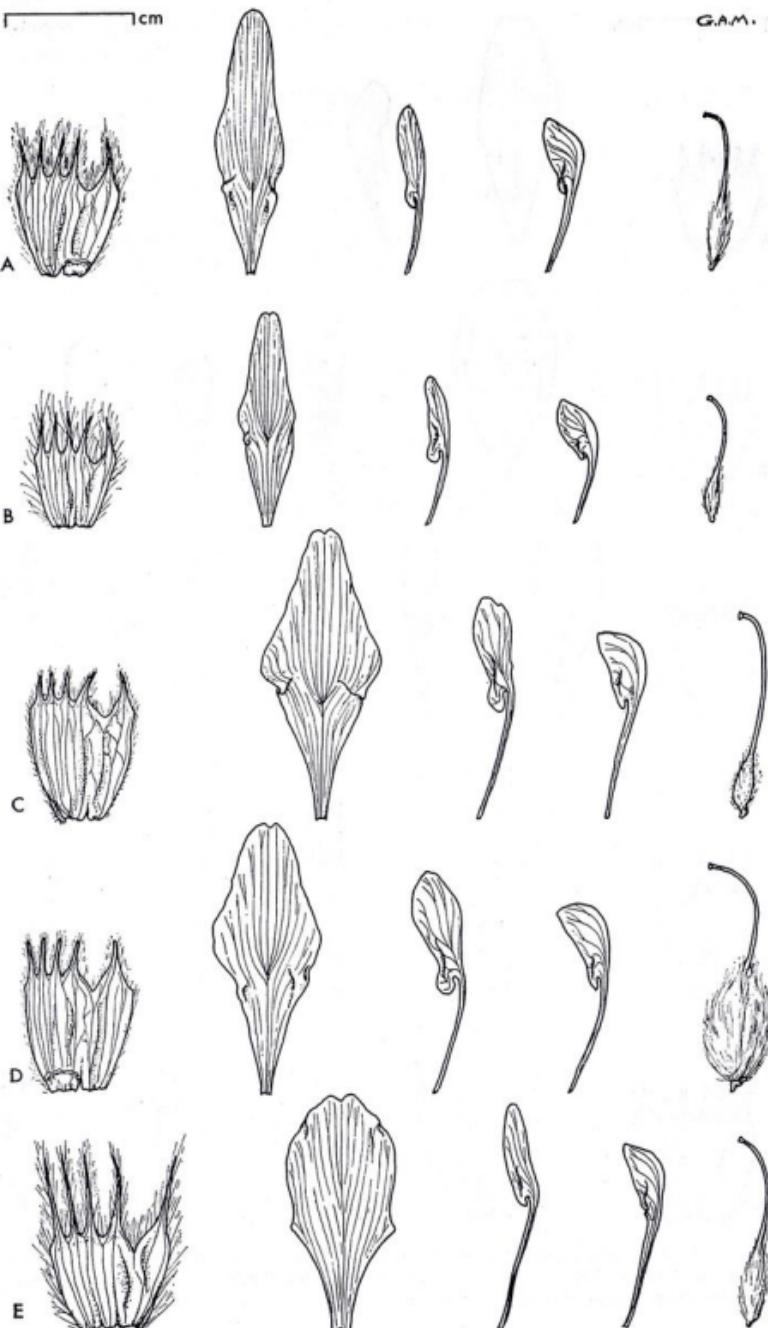


FIG. 2. A. *A. sparsipilis*. B. *A. coodei*. C. *A. bashkalensis*. D. *A. comosoides*. E. *A. baytopianus*.

A. yueksekovae Matthews, sp. nov. Fig. 3, a.

Fruticulus caulibus albo-villosis. *Folia* paripinnata 2–5 mm longa, rhachide spinosa; stipulae 7–10 mm longae, triangulari-lanceolatae albo-pilosae calvescentes ad dimidium connatae; foliola 5–6-juga, 5–10 mm longa, elliptica ad apicem spinosa, parce simpliciter pilosa. *Inflorescentiae* non approximatae, 1–2-floris sessilibus. *Bracteae* 5–6 mm longae, ovatae navicularae pilis albis vestitae. *Bracteolae* nullae. *Calyx* 10–12 mm longus, tubulosus simpliciter pilis albis patentibus pilosus; dentes 5–7 mm longi, setacei. *Corolla* lilacina; vexillum anguste ovatum 12–15 mm longum, glabrum; alae 13–15 mm longae; carina 12–13 mm longa. *Ovarium* albo-pilosum. *Legumen* ignotum.

TURKEY. C10 Hakkari: Vasinasor Tepe, 22 km NE of Yüksekova, 2750 m, 4 ix 66, *Cheese & Watson* 2259 (holo. K.).

This species is distinct and not closely related to any Turkish species in this section.

A. roseocalycinus Matthews, sp. nov. Fig. 3, b.

Fruticulus. *Folia* paripinnata usque ad 3 cm longa, rhachide spinosa; stipulae 8–10 mm longae, triangulari-ovatae, glabrae, ad dimidium connatae; foliola 3–5-juga, 5–15 mm longa, lanceolata, ad apicem spinosa, pilis patentibus simplicibus obsita. *Inflorescentia* globosa e floribus 6–15 sessilibus composita. *Bracteae* 6–10 mm longae, lanceolatae, apicem versus parce albo-pilosae. *Bracteolae* nullae. *Calyx* 16–18 mm longus, tubulosus, pilis longis albis patentibus simplicibus vestitus; dentes 10–13 mm longi, setacei subrosei. *Corolla* cremea; vexillum oblongum, 14–17 mm longum, glabrum; alae 12–14 mm longae; carina 12–15 mm longa. *Ovarium* albo-pilosum. *Legumen* ignotum.

TURKEY C4 İçel: 8 km from Mut to Karaman, 300 m, *Coode & Jones* 937 (holo. E).

A striking and distinct species with no known affinities.

Sect. ADIASPASTUS Bunge

A. eriocephalus Willd. subsp. **elongatus** Chamberlain & Matthews, subsp. nov. Fig. 3, d.

A subsp. *eriocephalo* capitulum oblongum, foliolis dense villosis differt. TURKEY. B9 Bitlis: 30 km from Nemrut Da., 2220 m, *Birand & Karamanoğlu* 229; Nemrut Da., 2300 m, on tuff in crater, *Davis* 23572. B9 Muş: between Bulanik and Muş, 2000 m, *Huber-Morath* 10681. C10 Hakkari: d. Yüksekova, Sat Da., NW of Sat Gölü, 2900–3000 m, igneous ridge, *Davis* 45683 (holo. E); heights due W of Seker Tepe, 22 km NE of Yüksekova, 2500 m, E. exposure, dry, bare stony scree, *Cheese & Watson* 1593.

Subsp. *eriocephalus* differs in having a globose capitulum and sparsely hairy leaflets. Although also endemic to E Anatolia, it has a more northerly distribution than subsp. *elongatus*. A specimen from C10 Hakkari: 21 km from Bacırge to Yüksekova, 2230 m, *Davis* 45231, is intermediate between the two subspecies in that the leaflets are densely hairy but the inflorescence is globose.

A. gevashensis Chamberlain & Matthews, sp. nov. Fig. 3, c.

A. karabaghensis Bunge affinis sed differt praesertim foliolis dense pubescentibus.

Fruticulus pulvinatus, spinosus. *Folia* paripinnata; rhachis spinosa, 2-4 cm longa, persistens; stipulae triangulari-lanceolatae, 9-11 mm longae, scariosae, ciliatae, inter se connatae; foliola 5-8-juga, anguste elliptica, 5-10(-16) × 2-3 mm, mucronulata, pilis simplicibus patentibus dense pubescentia. *Inflorescentiae* 3-4-florae, congestae, capitulum globosum vel ovoideum 2-3 cm longum c. 2 cm diametro 15-30-florum formantes. *Bracteae* lineares, 7-10 mm longae, canescentes. *Bracteolae* nullae. *Calyx* tubulosus, 13-16 mm longus, dense albo-pilosus; tubus 7-8 mm longus; dentes setacei. *Corolla* malvacea; vexillum platonychioideum, 17-19 mm longum, lamina c. 7 mm longa exauriculata; alae c. 16 mm longae; carina c. 13 mm longa. *Ovarium* dense pilosum, c. 8-ovulatum. *Legumen* ignotum. TURKEY. B9 Van: d. Gevaş, Artos Dağ, 2590 m, 14 vii 1954, Davis 22741 (holo. E, iso. K). B9 Bitlis: Karz Da., above Kotum, 1980 m, 28 vi 1954, Davis 22268; 15 km E of Tatvan, 1850 m, vii 1965, E. M. Rix 352, 353.

Allied to *A. karabaghensis* Bunge, a species occurring in E Anatolia. The latter may, however, be distinguished by its less hairy leaflets, etc. One of the specimens from near Tatvan (Rix 352) differs from the remainder in having a lax, elongate inflorescence and leaflets up to 16 mm long. We consider this to be no more than a shade form.

Sect. RHACOPHORUS Bunge

A. pannatus Huber-Morath & Chamberlain, sp. nov. Fig. 3, e.

A. lamarckii Boiss. affinis sed foliolis canescenti-tomentosis (non sericeis) et bracteis latioribus differt.

Fruticulus pulvinatus, spinosus. *Folia* paripinnata; rhachis 1-1.5 cm longa, spinosa, recta, persistens; stipulae triangulari-lanceolatae, c. 8 mm longae, scariosae, dense villosae, inter se connatae; foliola (2-)3-4-juga, elliptica vel obovata, 4-6 × 2-3 mm, mucronulata, pilis simplicibus canescenti-tomentosa. *Inflorescentiae* c. triflorae, axillares, congestae, capitulum densum globosum c. 1 cm diametro 10-20-florum formantes. *Bracteae* lanceolatae vel obovatae, 7-8 mm longae, planae vel navicularae, superne pilosae. *Bracteolae* nullae. *Calyx* 7-11 mm longus, in lacinias usque ad basin divisus, pilis albis simplicibus dense pilosus. *Corolla* in sicco malvina; vexillum stenonychioideum, 13-15 mm longum, lamina unguem aequante; alae c. 13 mm longae; carina c. 12 mm longa. *Legumen* c. 6 × 4 mm, ovoideum, pilosum, uniloculare, monospermum.

TURKEY. B6 Malatya: between Gürün and Darende, 1300 m, steppe, M. Zohary & Plitmann 1767-15. B7 Elâzığ: Ergani Maden, SSW of Signal Devedüzü, 18 ix 1939, Romieux. B7 Erzincan: d. Kemaliye, Felsschutt bei Salihli, 9 km ob Kemaliye, 1350 m, 24 vi 1949, A. Huber-Morath 10445 (holo. Hb. Hub.-Mor.).

Most closely allied to *A. lamarckii* Boiss., an E Anatolian species. The latter may, however, be distinguished by its sericeous leaflets and rather wider bracts.

A. patnosicus Chamberlain & Matthews, sp. nov. Fig. 4, a.

Fruticulus subspinosus. *Folia* imparipinnata; rhachis subspinosa, 7–15 cm longa, recta vel incurva, persistens; stipulae triangulari-lanceolatae, c. 10 mm longae, scariosae, dense villosae, inter se connatae; foliola 6–7-juga, anguste elliptica, 10–18 × 4–5 mm, pilis brevis simplicibus sericea. *Capitulum* ovoideum, c. 5 cm longum, c. 4 cm diametro, c. 50-florum e inflorescentiis sessilibus, 5–6-floris compositum. *Bracteae* oblongae vel spathulatae, c. 7 mm longae, superne villosae. *Bracteolae* nullae. *Calyx* 7–9 mm longus, usque ad basin fissus laciniis superne incurvis ut videtur tubum 4–6 mm longum formantibus. *Corolla* colore ignota; vexillum stenonychoideum, 17–19 mm longum, lamina basi auriculata, c. 9 mm longa; alae c. 14 mm longae; carina c. 11 mm longa. *Legumen* immaturum pilosum, uniloculare, c. 6-ovulatum.

TURKEY. B9 Ağrı/Van: between Ercis and Patnos, 1980 m, high steppe, somewhat moist soil, 21 vi 1964, M. Zohary & Plitmann 2167–76 (holo. HUJ).

Only known from the type locality. A distinctive species, perhaps allied to *A. basianicus* Boiss. from E Anatolia & N Iraq.

Sect. PTEROPHORUS Bunge

A. cymbibracteatus Huber-Morath & Chamberlain, sp. nov. Fig. 4, c.

A. podperae Širj. et *A. condensato* Ledeb. affinis sed ab utroque bracteis laticribus, inflorescentibus floris paucioribus differt.

Fruticulus pulvinatus, spinosus. *Folia* paripinnata; rhachis spinosa, 1–2 cm longa, stricta, persistens; stipulae ovato-lanceolatae, 6–8 mm longae, scariosae, pilosae, inter se connatae; foliola 3–4-juga, anguste elliptica 4–8 × c. 2 mm, spinulosa, pilis simplicibus dense pilosa. *Inflorescentiae* 3–4-florae, axillares, congestae, capitulum densum globosum 1·5–2·5 cm diametro 4–10-florum formantes. *Bracteae* ovato-lanceolatae, navicularis, superne lanatae. *Bracteolae* lineares, 7–9 mm longae, dense pilosae. *Calyx* 8–10 mm longus, dense pilosus, in lacinias lineares usque ad basin divisus. *Corolla* in sicco purpurascens; vexillum stenonychoideum, (12–)16–18 mm longum; lamina c. 8 mm longa basi auriculata; alae c. 16 mm longae; carina c. 17 mm longa. *Ovarium* 4-ovulatum; stylus basi hirsutus. *Legumen* ignotum.

TURKEY. B6 Sivas: d. Kangal, Tecer-Gürün, 2 km ob Bögürdelik, 1820 m, Steppe, 21 vii 1958, A. Huber-Morath 15074 (holo. Hb. Hub.-Mor.); S of Ulaş, nr. Sivas, M. & D. Zohary 3272. B6 Maraş: 16 km from Göksun to Sarız, 1380 m, Huber-Morath 11925. B6 Adana: 36 km from Saimbeyli to Göksun, 1400 m, Steppe, Huber-Morath 11453.

A. cymbibracteatus is probably allied to *A. podperae* Širj. and *A. condensatus* Ledeb., both C Anatolian species, but may be distinguished from both by its broad bracts. *A. cymbibracteatus* also closely resembles *A. lamarckii* Boiss. in Sect. *Rhacophorus*, an E Anatolian species, and can only be separated from it by the presence of bracteoles.

A. kirshehiricus Chamberlain, sp. nov. Fig. 4, b.

A. tallaseo Boiss. & Bal. affinis sed differt bracteis et stipulis brevioribus (in illa 8 mm et 8–10 mm longis).

Fruticulus pulvinatus, spinosus. *Folia* paripinnata; rhachis spinosa, 1-3·5 cm longa, recurvata; stipulae ovato-triangulares, 4-8 mm longae, scariosae, pilosae, inter se connatae; foliola 2-6-juga, anguste elliptica, 4-6 mm longa, mucronulata, pilis simplicibus pilosa. *Capitulum* densum, globosum vel ovoideum, 1·5-2 cm diametro, 20-50-florum e inflorescentiis sessilibus, 3-4-floris compositum. *Bracteae* late ovatae, acutae, circa tam longae quam latae, saepe bilobatae, in parte superiore pilosae. *Bracteolae* lineares, dense pilosae, laciniae calycis similares. *Calyx* 7-8 mm longus, dense pilosus, in lacinias usque ad basin divisus. *Corolla* in sicco straminea; vexillum 10-12 mm longum, stenonychioideum, lamina c. 7 mm longa basi auriculata; alae c. 11 mm longae; carina c. 9 mm longa. *Stylus* hirsutus. *Legumen* ovoideum, c. 5 × 2 mm, dense pilosum, in corolla sicca inclusum, monospermum.

TURKEY. B4 Konya: 3 km from Cihanbeyli to Tuz Gölu, 900 m, *Dudley* (Davis 35937). B5 Kirşehir: 24 km NW of Kirşehir, 1000 m, steppe soil, 29 viii 1959, M. & D. Zohary 2385 (holo. HUJ).

A. kirshehiricus is closely allied to *A. tallaseus* Boiss. & Bal. The latter differs however in its larger bracts and stipules (8 mm and 8-10 mm long respectively). The broad bracts distinguish *A. kirshehiricus* from the majority of the remaining species in Sect. *Pterophorus*.

Sect. MACROPHYLLIUM Bunge

A. hakkiaricus Chamberlain & Matthews, sp. nov. Fig. 5, a.

Frutex usque ad c. 50 cm altus; caules c. 10 cm longi. *Folia* paripinnata 13-20 cm longa, rhachide spinosa incurva; stipulae 10-14 mm longae, triangulari-lanceolatae, villosae, connatae; foliola 5-7-juga, 25-40 mm longa, elliptica, ad apicem spinosa, glabra vel pilis sparsis obsita. *Flores* in axillis foliorum sessiles; capitulum globosum, 3-5 cm diametro, 30-60-florum. *Bracteae* 9-10 mm, oblongo-spathulatae, apicem versus tomentosae. *Bracteolae* nullae. *Calyx* 9-10 mm longus, dense piloso-tomentosus, in lacinias lineares usque ad basin divisus sed pilis albis intertextis tubum formantibus. *Corolla* rosea; vexillum 17-22 mm longum, glabrum, lamina ungue longiore basi auriculata; alae 16-19 mm longae; carina 14-17 mm longa. *Ovarium* albo-pilosum. *Legumen* ignotum.

TURKEY. C9 Hakkari: Marinos Dere above Marunis, 20 km from bridge across Zap (Cento road), 1900 m, rocky limestone slopes; perennial 0·5 m shrub; flowers pink, 21 vi 1966, *Davis* 45380 (holo. E).

The affinities of this species are not known.

A. isauricus Huber-Morath & Matthews, sp. nov. Fig. 4, d.

Haec species valde affinis *A. deinacantho* Boiss. a quo stipulis brevioribus, bracteis latioribus glabrisque, floribus inflorescentiae paucioribus differt.

Frutex laxus; caules 5-10 cm longi, glabri. *Folia* paripinnata 20-25 cm longa, rhachide spinosa incurva; stipulae 12-15 mm longae, triangulari-lanceolatae membranaceae glabrescentes, longe connatae; foliola 7-11-juga, 16-22 mm longa, anguste elliptica, ad apicem spinosa, glabra vel parcissime pilis simplicibus obsita. *Flores* in axillis foliorum sessiles; capitulum oblongum, 6-7 × 4 cm, 20-30-florum. *Bracteae* c. 12 mm longae, lanceolatae vel ovatae, navicularae glabrae. *Bracteolae* nullae. *Calyx* c. 14 mm longus,

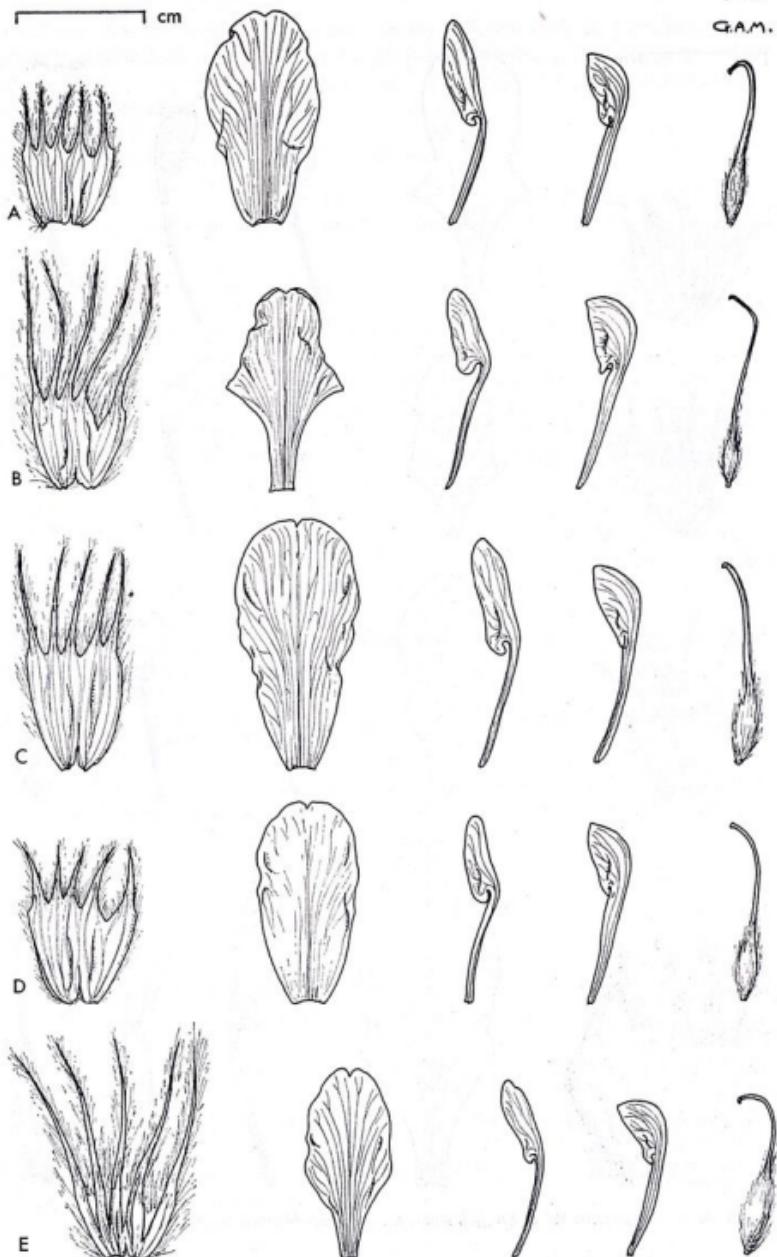


FIG. 3. A. *A. yueksekovae*. B. *A. roseocalycinus*. C. *A. gevashensis*. D. *A. eriocephalus*
subsp. *elongatus*. E. *A. pennatulus*.

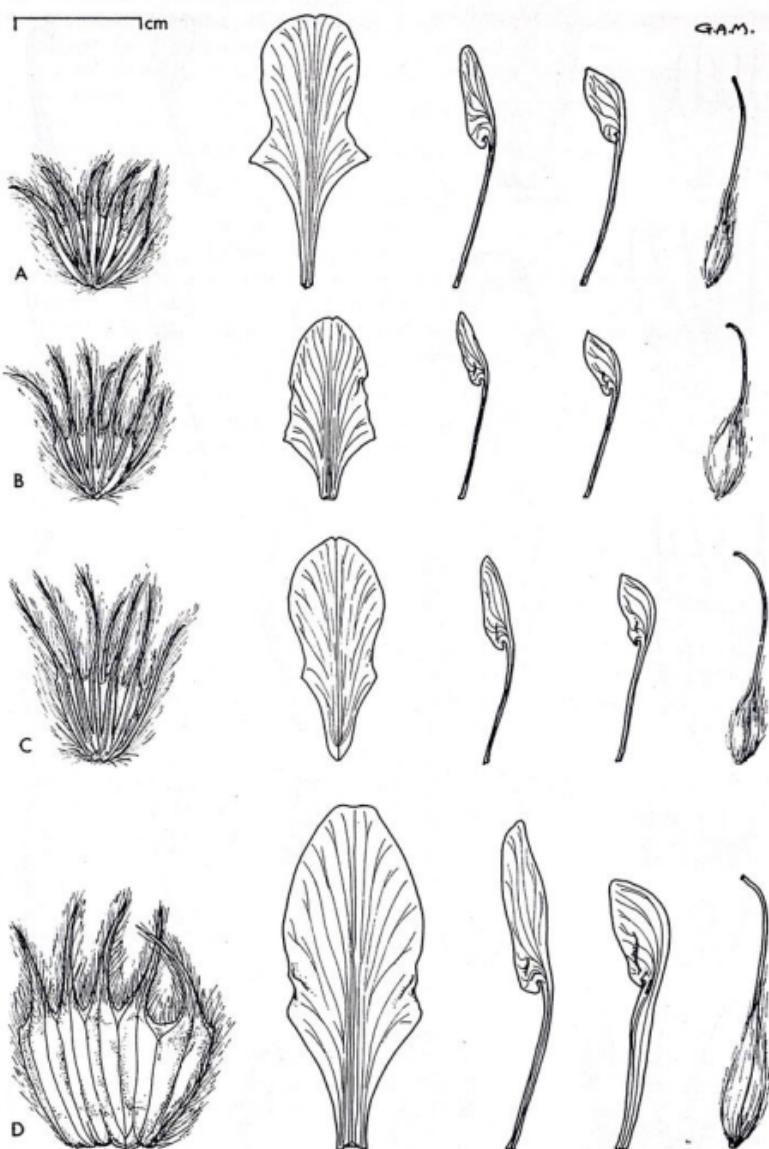


FIG. 4. A. *A. patnosicus*. B. *A. kirshehiricus*. C. *A. cymbibracteatus*. D. *A. isauricus*.

tubulosus dense et longe albo-pilosus; tubus 7–8 mm longus. *Corolla* colore ignota; vexillum 20–25 mm longum, glabrum, lamina ungue longiore basi subauriculata; alae 19–23 mm longae; carina c. 20 mm longa. *Ovarium* albo-pilosum. *Legumen* ignotum.

TURKEY. C4 Konya: d. Hadim, above Taşkent, 1500 m, 16 vi 1948, A. Huber-Morath 8347 (holo. Hb. Hub.-Mor.).

Possibly related to *A. deinacanthus* Boiss. from which it differs in its shorter stipules, wider glabrous bracts and fewer-flowered inflorescence.

Sect. HYMENOSTEGIS Bunge

A. trifoliastrum Huber-Morath & Matthews, sp. nov. Fig. 5, b.

Fruticulus laxus caulis brevibus. *Folia* paripinnata 2–4 cm longa, rhachide spinosa; stipulae 13–16 mm longae, lanceolatae membranaceae glabrae ciliatae basi connatae; foliola 2–3-juga, 15–25 mm longa, lanceolato-elliptica acuta, ad apicem spinosa, supra glabra, subtus pilis sparsis simplicibus sericea. *Pedunculi* scapiformes foliis breviores, longe albo-pilosi. *Spica* late ovoidea, 3–5 × 2·5–3·5 cm, dense 15–40-flora. *Bracteae* 9–12 mm longae, ovatae acuminatae paleaceae glabrae ciliatae. *Bracteolae* nullae. *Calyx* 13–15 mm longus, initio tubulosus denique inflatus, pilis longis simplicibus albis patentibus vestitus; dentes 5–6 mm longi, lineares. *Corolla* albida; vexillum 15–18 mm longum, glabrum, lamina plus minusve recurva anguste ovata basi auriculata; alae 17–18 mm longae; carina c. 18 mm longa. *Ovarium* ellipticum compressum, dense et breviter simpliciter albo-pilosum. *Legumen* ignotum.

TURKEY. B9 Van: d. Van, Van-Hoşap, 20 km N von Van, *Cousinia*-steppe, 1950 m, 8 vii 1951, Renz & Simon, A. Huber-Morath 11467 (holo. Hb. Hub.-Mor.); 7 km from Van to Erçek, 1850 m, Davis 44283.

This species is possibly related to *A. woronovii* Bornm. It differs in its longer leaflets which are glabrous above, in its longer stipules and in having a larger number of flowers per inflorescence.

Sect. MEGLACYSTIS Bunge

A. ermineus Matthews, sp. nov. Fig. 5, c.

Affinis *A. szovitsii* Fisch. & Mey., a quo calyce albo nigroque piloso, vexillo longiore sine auriculis basalibus differt.

Suffrutex pumilus caespitosus, caulis brevibus. *Folia* imparipinnata 2–3 cm longa, rhachide spinosa; stipulae c. 5 mm longae, triangular-lanceolatae, glabrae sed albo-ciliatae, ad dimidium connatae; foliola 8–11 juga, 2–3 mm longa, elliptica, pilis simplicibus adpressis vestita. *Pedunculi* folia aequantes vel superantes pilis nigris albisque pilosi. *Flores* 3–5 spicam densam formantes. *Bracteae* 5–7 mm longae, ovatae pilis nigris albisque obsoitae. *Bracteolae* 2–3 mm longae, lanceolatae. *Calyx* 13–16 mm, initio tubulosus denique inflatescens, pilis sparsis simplicibus nigris albisque vestitus; dentes 2–3 mm, dense nigro-pilosi. *Corolla* erminea, interdum carina lilacina; vexillum 20–25 mm longum, ovatum, lamina recurva sine auriculis basalibus; alae 23–25 mm longae; carina c. 20 mm longa. *Ovarium* breviter albo-pilosum. *Legumen* ignotum.

TURKEY. B9 Van: d. Gevas, Artos Da., 3050 m, rocky ground, flowers creamy, keel lilac, 14 vi 1954, *Davis & Polunin*, D. 22729 (holo. E); Artos Da., 3350 m, D. 22872. B9 Van/Siirt: Kavuşşahap Da., S of Pasvanik, N side above Arzik, 2900 m, *Cheese & Watson* 3575. C10 Hakkari: Mor Da., 3600 m, *Cheese & Watson* 3651.

This species is near to *A. szovitsii* Fisch. & Mey. but has a longer exserted standard and a calyx with black and white hairs.

Sect. ALOPECIAS Bunge

A. maximus Willd. var. **dasyseimus** Chamberlain & Matthews, var. nov. Fig. 5, d.

A var. *maximo* vexillo parce hirsuto, dentibus calycis brevioribus 1.5-3 mm longis differt.

TURKEY. A8 Gümüşane: between Aşkale and Bayburt, c. 2300 m, on slopes, 15 vii 1964, *Karamanoğlu* 1644 (holo. ANK); Vanek Da., 1200 m, *Balls* 1554a.

The occurrence of hairy standards is a rare feature in Sect. *Alopecias*. However, since other correlated differences by which this taxon may be distinguished from var. *maximus* are minor, we consider it best to treat it as a variety of *A. maximus*. Var. *maximus* grows in S Russia, Georgia and Soviet Armenia as well as in NE Anatolia.

A. oocephalus Boiss. subsp. **stachyophorus** Huber-Morath & Chamberlain, subsp. nov. Fig. 6, a.

Differit a subsp. *oocephalo* inflorescentiis cylindricis 50-100-floris et caulinis juvenilibus glabris.

TURKEY. B7 Tunceli: Pertek—Tunceli, 28 km N von Pertek, 1250 m, *Vicia ervilia*-Feld, 24 vi 1951, *A. Huber-Morath* 11427 (holo. Hb. Hub.-Mor.); 60 km from Elâzığ to Tunceli, 3 vii 1950, *Reese*. B8/C8 Siirt: Korky to Zok, B. Post 610. C8 Urfa: Ceylanpinar, 540 m, *Karamanoğlu* 1292.

Subsp. *oocephalus* occurs in S & E Anatolia, Palestine and the Syrian Desert. Subsp. *stachyophorus* is known only from E Anatolia.

Sect. ONOBRYCHIUM Bunge

A. atrocarpus Chamberlain & Matthews, sp. nov. Fig. 6, c.

Herba perennis, erecta, caulescens, 30-35 cm alta. *Folia* imparipinnata, 4.5-6 cm longa; stipulae ovatae, 4-5 mm longae, scariosae, pilis albis nigrisque parce pilosae, breviter connatae, a petiolo liberae; foliola 7-9-juga, anguste elliptica 8-10 × c. 3 mm, pilis adpressis bifurcatis parce hirsuta. *Pedunculi* 10-16 mm longi, pilis nigris adpressis parce pilosi. *Spica* densa, ovoidea, c. 2 cm longa et 1 cm lata, 10-15-flora. *Bracteae* lanceolatae, c. 3 mm longae. *Calyx* campanulatus, c. 7 mm longus, pilis albis nigrisque bifurcatis vestitus; dentes lineares, c. 2 mm longi. *Corolla* colore ignoto; vexillum lingulatum, 16-17 × 6 mm, lamina ungue longiore; alae c. 14 mm longae; carina c. 10 mm longa. *Legumen* ovoideum, erecto-patens, 5-6 ×

3 mm, pilis tuberculatis nigris paucis albisque dense setosum; rostrum c. 2 mm, recurvum.

TURKEY. A8 Erzurum: in jugo Kop Dagh inter Aşkale et Bayburt, 2300–2500 m, 18 viii 1967, K. H. Rechinger 37681 (holo. E, iso. W).

Only known from the fruiting type gathering. It is possibly allied to *A. bungeanus* Boiss., which may, however, be distinguished by its finely white-adpressed-hairy legumes.

Sect. HOOLEUCE Bunge

A. stenosemioides [Bornm. ex] Chamberlain & Matthews, sp. nov. Fig. 6, d.
Syn: *A. stenosemioides* Bornm. in Feddes Rep. Beih. 89(3): 187, t. 12 (1938),
nomen nudum.

Herba perennis, minuta, e base indurato, scaposa. *Folia* imparipinnata, 1–2 cm longa; stipulae ovato-lanceolatae vel lanceolatae, 4–6 mm longae, scariosae, ciliatae; foliola 5–8-juga, anguste elliptica, pilis bifurcatis sericea. *Pedunculi* 1–2 cm longi, pilosi. *Spica* dense globosa, c. 1.5 cm diametro, 15–25-flora. *Bracteae* lanceolatae, c. 4 mm longae. *Bracteolae* nullae. *Calyx* tubulosus, c. 6 mm longus, pilis nigris albis paucisque vestitus; dentes lineares, c. 3 mm longi. *Corolla* purpurea; vexillum lingulatum, (6–)12–14 × c. 2 mm, lamina ungue multo longiore; alae c. 9 mm longae; carina c. 6 mm longa. *Ovarium* et legumen ignotum.

TURKEY. B5 Kayseri: Cappadocia, in excelsis montis Argaei (Erciyas Da.), 2700–3000 m, 18 vi 1890, Bornmüller 1637 (holo. BM, iso. W). Erciyas Da., 2200–2330 m, non-lime scree, Balls 1418; ibid. c. 2200 m, steppe, Sorger 64–26–8.

Only known from the type locality. Allied to *A. stenosemius* Boiss. & Noë but smaller in its vegetative parts and with fewer flowers per spike. *A. stenosemius* is endemic to N & C Anatolia.

Sect. TRACHYCERCIS Bunge

A. syringus Chamberlain, sp. nov. Fig. 6, b.

A. armeniaco Boiss. et *A. microrchidi* Barbey affinis sed differt a priore foliolis supra sericeis (in illa supra glabris) et calyce pilis albis vestito (in illa pilis nigris albis paucisque vestito), a posteriore stipulis longioribus linearibus et corolla violacea (in illa lutea).

Herba perennis, acaulis, e caudice ramoso indurato prostrata. *Folia* imparipinnata, 2–5 cm longa; stipulae lineares, 6–8 mm longae, scariosae, dense adpresso-pilosas, inter se liberae, ad petiolem breviter adnatae; foliola 8–11-juga, anguste-elliptica, 6–8 × c. 2 mm, pilis bifurcatis sericea. *Racemus* sessilis, (1–)5–10-florus. *Bracteae* lineares, c. 5 mm longae. *Bracteolae* nullae. *Calyx* tubulosus, c. 10 mm longus, pilis longis albis bifurcatis adpresso-pilosus; dentes lineares, 4–6 mm longi. *Corolla* lilacina; vexillum lingulatum, c. 20 mm longum, lamina auriculata ungue longiore; alae c. 19 mm longae; carina c. 17 mm longa. *Ovarium* parce pilosum. *Legumen* ignotum.

1 cm

G.A.M.



FIG. 5. A. *A. hakkiaricus*. B. *A. trifoliastrum*. C. *A. ermineus*. D. *A. maximus* var. *dasysemeius*.

1 cm



FIG. 6. A. *A. oocephalus* subsp. *stachyophorus*. B. *A. syringus*. C. *A. atrocarpus*. D. *A. stenosemioides*. E. *A. albicalycinus*.

TURKEY. A4 Kastamonu: 5 km N of Kastamonu; 900 m, calcareous marl hills, 7 vi 1954, Davis 21639 (holo. E). A5 Amasya: Sana Dağ, 1600 m, Bornmüller 1890:2089.

A. syringus closely resembles *A. armeniacus* Boiss. from NE Anatolia and *A. microrchis* Barbey from SW Anatolia. The former differs in having leaflets glabrous above (in *A. syringus* they are equally hairy on both surfaces) and in its predominantly black-hairy calyces. *A. microrchis* differs in its lanceolate, shorter stipules (c. 4 mm long) and in its yellow corolla.

Sect. PROSELIUS Bunge

A. campylosema Boiss., Diagn. ser. 1(2): 82 (1843). Fig. 7.

subsp. ***atropurpureus*** (Boiss.) Chamberlain, comb. et stat. nov.

Syn.: *A. atropurpureus* Boiss., Diagn. ser. 1(9): 54 (1849); *A. pithyusarum* Bornm. in Feddes Rep. Beih. 89(4): 190 (1940).

subsp. ***nigripilis*** Huber-Morath & Chamberlain, subsp. nov.

A subsp. *campylosemate* leguminibus praecipue vel omnino nigropilosus et dentibus calycinis brevioribus 1-2(-3) mm longis differt.

TURKEY. A8 Gümüşane: d. Bayburt, Kop Dağ, Aşkale-Bayburt, alpine Trift 5 km N der Passhöhe, 1950-2000 m, flowers rose, 28 vi 1951, *A. Huber-Morath* 11418 (holo. Hb. Hub.-Mor.). A8 Erzurum: 59 km NW from Erzurum to Ispir, 1900 m, calcareous scree, flowers violet, *Hub.-Mor.* 16139; pass 41 km S from Ispir to Erzurum, 2200-2250 m, alpine meadow, flowers white, *Huber-Morath* 16140. A9 Erzurum: 14 km N of Horasan, 1900 m, *Davis* 29525. B8 Erzurum: Palendöken Da., 20-23 km from Çat to Erzurum, 2300-2350 m, *Davis* 47365. B9 Ağrı: E side of Tahir pass, 19 km from Aleşkirt to Horasan, 2400 m, sloping meadows in gully, *Davis* 47220; 2 km SW of Hamur (Murat valley), 1680 m, sloping meadow, flowers creamy white, *Davis* 44083. B9 Van: nr. Bendimahi, 1700 m, steppe nr. lake, flowers creamy white, *Davis* 44151.

A. campylosema Boiss., a species probably endemic to Anatolia can be split into three subspecies, subsp. *campylosema*, subsp. *atropurpureus* (Boiss.) Chamberlain and subsp. *nigripilis* Huber-Morath & Chamberlain. They may be distinguished as indicated in the key below.

1. Calyx predominantly black-hairy, at least when in fruit, teeth 1-4 mm; corolla pale yellow to violet

2. Legume adpressed white-hairy; calyx teeth 2-4 mm

subsp. *campylosema*

2. Legume almost entirely adpressed black-hairy; calyx teeth 1-2(-3) mm subsp. *nigripilis*

1. Calyx predominantly white-hairy, teeth 3-5 mm; corolla brownish-red subsp. *atropurpureus*

Subsp. *campylosema* overlaps in its distribution with the western subsp. *atropurpureus* and the eastern subsp. *nigripilis* and affords a geographical as well as a morphological link between them. The variation in flower colour of both subsp. *campylosema* and subsp. *nigripilis* (from white through rose to violet) may indicate that hybridisation has taken place, possibly involving subsp. *atropurpureus* as one parent. The variation pattern is, however, complex, and further study is required before drawing any final conclusions.

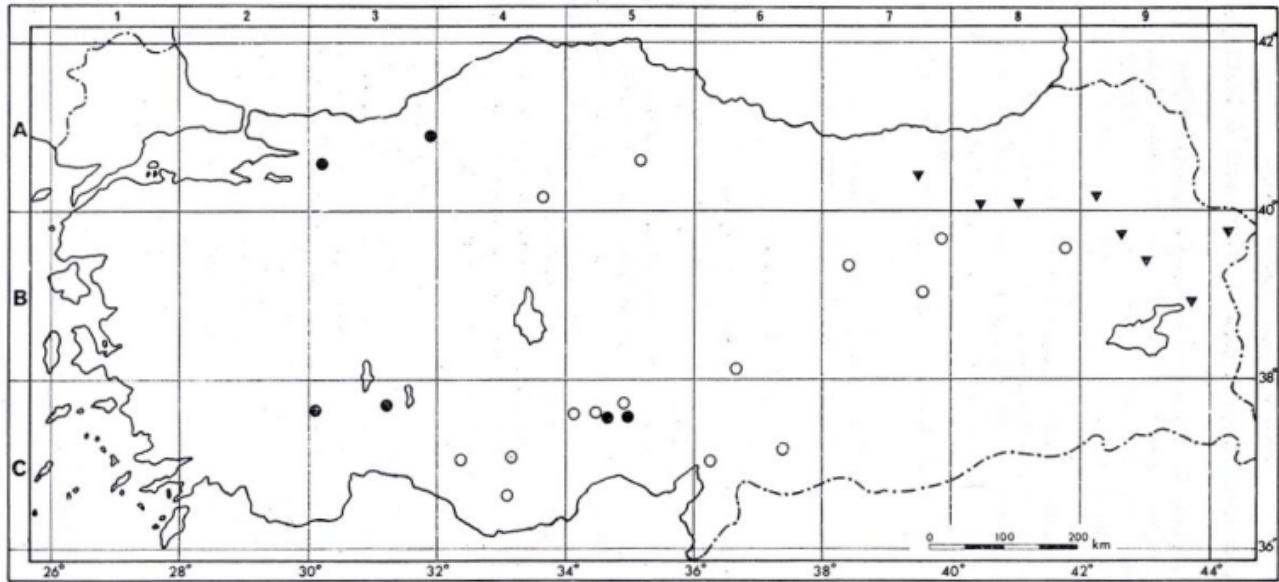


FIG. 7. Distribution map of *A. campyloosema*. ○ subsp. *campyloosema*. ● subsp. *atropurpureus*. ▼ subsp. *nigripilis*.

Sect. MELANOCERCIS Bunge

A. angustifolius Lam. subsp. **longidens** Huber-Morath & Matthews, subsp. nov.

A subsp. *angustifolio* calycis dentibus tubo aequilongis differt.

TURKEY. B₃ Afyon: 24 km S of Emir Da., 1100 m, chalky slope, 13 vi 1965, Coode & Jones 2324. B₃ Konya: S side of Sultan Da., 1300 m, 3 vi 1935, Reese. B₃ Isparta: Barla Da., 1500 m, steppe, 6 vi 1967, Cheese & Watson 2577. B₅ Kayseri: Erciyas Da., 1200 m, v 1902, Zederbauer. C₃ Burdur: 10 km from Burdur to Antalya, steppe, 10 vi 1938, Huber-Morath 5314; 42 km from Burdur to Antalya, 800 m, 11 vi 1938, Huber-Morath 5311; 111 km from Antalya to Elmali, Alava & Bocquet 5211. C₄ Konya: 20 km W of Konya, 1250 m, Ehrendorfer 62-1/63-11. C₄ İçel: d. Gülnar, Kalkhâne mit *Quercus coccifera* E ob Gülnar, 900-970 m, 7 vi 1950, A. Huber-Morath 10436 (holo. Hb. Hub.-Mor.). C₅ İçel: Gusguta valley, 1400 m, Siehe 1895:262.

This new subspecies has a more restricted distribution within Turkey than either subsp. *angustifolius* or subsp. *pungens* (Willd.) Hayek.

Sect. CYSTODES Bunge

A. albicalycinus Huber-Morath & Matthews, sp. nov. Fig. 6, e.

Affinis *A. melanocephalo* Boiss., a quo calyce albo-pilosus, corolla cremea, leguminibus longioribus differt.

Suffrutex caulis adpresso albo-canescens ad 30 cm longis erectis. *Folia* imparipinnata 2-6 cm longa; stipulae 3-4 mm longae, triangulares lineares pilis albis vestitae; foliola 2-3(-4)-juga, 10-20 mm longa, anguste elliptica acuta mucronulata pilis bifurcatis sericea. *Pedunculi* folia superantes, sericei. *Spica* densa capituliformis, 10-15-flora. *Bracteae* 3-4 mm longae, lineares pilis albis vestitae. *Bracteolae* nullae. *Calyx* 18-25 mm longus, initio tubulosus denique leviter inflatescens, interdum subroseus, dense et breviter simpliciter albo-pilosus; dentes 5-6 mm longi, anguste triangulares. *Corolla* cremea; vexillum 20-25 mm longum, glabrum, lamina ovata plus minusve recurva; alae 20-24 mm longae; carina 18-20 mm longa. *Legumen* lineare, 25-30 mm longum, 3-4 mm latum, pilis basi tuberculatis longis albis simplicibus patentibus vestitum; rostrum 3-7 mm longum.

TURKEY. C₄ İçel: d. Gülnar, Kalkhâne um Gülnar, *Pinus brutia*-Gehölz, 900-940 m, 6 vi 1950, A. Huber-Morath 9845 (holo. Hb. Hub.-Mor.); 2 km N of Mut on road to Karaman, hilly steppe, 290 m, 5 vi 1966, Sorger 66-18-1; 8 km from Mut to Karaman, open mudstone slope under *Pinus brutia*, 12 v 1965, Coode & Jones 917; 40 km S of Mut on road to Silifke, 400 m, chalk slope, 15 v 1965, Coode & Jones 1059. C₄ Konya: Ermenek, 1350 m, 13 viii 1949, Davis 16151; 30 km from Ermenek to Fariske, 1350 m, *Quercus coccifera* macchie, 12 vi 1950, Huber-Morath 9844.

*Species incertae sedis***A. davisii** Chamberlain & Matthews, sp. nov. Fig. 8.

Perennis scaposus caudice lignoso et caulis prostratis vel ascendentibus. *Folia* imparipinnata 10-20 cm longa; stipulae 12-15 mm longae, lanceolatae



FIG. 8. *A. davisii*. a, flowering plant. b, dissected calyx. c, standard. d, wing. e, keel. f, ovary.

albo-ciliatae membranaceae ad basin connatae; foliola 15–18-juga, 8–14 mm longa, elliptica acuta mucronata, pilis patulis plus minusve longis simplicibus vestita. *Pedunculi* folia aequantes vel longioribus, pilis patulis vestiti. *Flores* fragrantes in racemis densis ovoideis 8–18-floribus. *Bracteae* 10–15 mm longae, lanceolatae albo-pilosae. *Bracteolae* 4–8 mm longae, lineares. *Calyx* 14–16 mm longus, tubuloso-campanulatus, leviter inflatescens, parce patule simpliciter albo-pilosus; dentes 7–8 mm longi, triangulari-lineares. *Corolla* cremea; vexillum 22–26 mm longum, glabrum, lamina recurva ovata emarginata; alae 19–22 mm longae; carina 17–20 mm longa. *Ovarium* ovoideum, albo-pilosum. *Legumen* ignotum.

TURKEY. B9 Van: N side of Erek Dağ, above Değirmenköy, 3200 m, rocky igneous slopes and meadows, procumbent or ascending perennial, flowers creamy white, fragrant, 6 vi 1966, Davis 44465 (holo. E). Bitlis: Kisvak Da. 9 km NE of Tatvan, 1900 m, W exposure, pasture and scattered *Quercus* scrub, flowers cream, Cheese & Watson 1299.

This beautiful species is so distinct that we have not placed it in any existing section and are reluctant to describe a new section without fruiting material and without making a study of *Astragalus* outside Turkey. The sections which it most closely approaches are *Hymenostegis* (from which it differs in its imparipinnate leaves and bracteolate flowers), *Megalocystis* (from which it differs in its imparipinnate leaves), *Halicacabus* (from which it differs in its calyx never becoming globose-inflated), and *Rhabdotus* (from which it differs in its bracteolate flowers).